The invention claimed is:

1. An apparatus for use with a specimen, the apparatus comprising:

a femtosecond laser operable to emit a laser beam of less than about 50 femtosecond pulse duration upon the specimen;

a pulse shaper operable to shape the laser beam;

a device operable to detect characteristics of the specimen when the shaped laser beam has been emitted upon the specimen; and

an electrical control system connected to the device and the pulse shaper, the electrical control system operably varying the pulse shaping performance of the pulse shaper for subsequent laser beam emissions based on an evaluation of the characteristics detected by the device.

2. The apparatus of Claim 1 wherein the pulse shaper includes a Fourier plane.

3. The apparatus of Claim 2 wherein the pulse shaper further includes at least one collimating optic and a dispersive optic.

4. The apparatus of Claim 3 wherein the pulse shaper includes a second collimating optic and a second dispersive optic, wherein the Fourier plane is optically located between the collimating optics.

5. The apparatus of Claim 1 wherein the specimen is a protein.

6. The apparatus of Claim 5 wherein the electrical control system determines the protein sequence of the specimen.

7. The apparatus of Claim 5 wherein the laser beam selectively cleaves bonds in the specimen.

8. The apparatus of Claim 5 wherein there is direct laser desorption of the protein specimen free of a matrix.

9. The apparatus of Claim 1 wherein the device is a mass spectrometer.

10. The apparatus of Claim 9 wherein matrix-assisted laser desorption ionization, post-source decay mass spectrometry is employed to analyze the specimen by the mass spectrometer and electrical control system.

11. The apparatus of Claim 1 wherein the pulse shaper includes an acousto-optic modulator operable to control amplitude and phase of the laser beam.

12. The apparatus of Claim 11 wherein the acousto-optic modulator includes an anti-reflection coated Tellurium Dioxide crystal with a piezo-electric transducer.

13. The apparatus of Claim 1 wherein the pulse shaper includes a liquid crystal display operable to control amplitude and phase of the laser beam.

14. The apparatus of Claim 1 wherein the pulse shaper includes a deformable mirror.

15. The apparatus of Claim 1 wherein the electrical control system automatically determines the most desirable laser beam pulse shape based on prior device results using substantially randomly employed pulse shapes.

16. The apparatus of Claim 1 wherein the femtosecond laser operably transmits a laser beam of less than 11 femtosecond duration.

17. The apparatus of Claim 1 wherein the specimen is multi-molecular.

18. A system for use with a sample, the system comprising:

laser beam pulses operably emitted upon the sample; and

a pulse shaper operable to vary shapes of the laser beam pulses;

wherein the shaped laser beam pulses chemically modify the sample.

19. The system of Claim 18 wherein the shaped laser beam pulses selectively cleave atomic bonds in the sample.

20. The system of Claim 19 wherein chemical bonds are selectively cleaved in the sample.

21. The system of Claim 18 further comprising a laser operably emitting the laser beam pulses with less than 50 femtosecond durations.

22. The system of Claim 18 further comprising an electrical control system operably causing the pulse shaper to vary the laser beam pulse shapes based on modification results in an automatic manner.

23. A system comprising:

a specimen substrate having isolated molecules;

at least one laser beam pulse operably emitted upon the molecules; and

a pulse modification device operably changing an excitation characteristic of the emitted pulse;

wherein the modified laser beam pulse causes desorption of the isolated molecules.

24. The system of Claim 23 wherein the specimen does not use a matrix between the molecules, and the pulse modification device is a pulse shaper.

25. A system for use with a sample, the system comprising:

a laser operable to emit a laser beam pulse upon the sample;

a mass spectrometer operable to analyze ionization of the sample; and

an electrical control system operable to cause the laser beam pulse to be modified prior to it being received by the sample, the electrical control system further modifying and substantially optimizing at least one characteristic of subsequent laser beam pulses.

26. The system of Claim 25 wherein the modification and optimization includes a laser beam pulse having a combination of pulse durations determined by the electrical control system.

27. The system of Claim 25 wherein the modification and optimization includes a laser beam pulse having a combination of pulse shapes determined by the electrical control system.

28. The system of Claim 25 wherein the modification and optimization includes a laser beam pulse having a combination of pulse wavelengths determined by the electrical control system.

29. A control system for use with a specimen, the system comprising:

a laser operable to emit a laser beam upon the specimen;

a pulse shaper operable to shape the laser beam;

a detection device operable to detect characteristics of the specimen when the shaped laser beam has been emitted upon the specimen; and

a control device connected to the detection device and the pulse shaper;

the control device automatically varying the pulse shapes for subsequent laser beam emissions based at least in part on at least one signal generated by the detection device;

the control device operably comparing a target to each pulse shape result as detected by the detection device;

the control device operably causing the laser to emit laser beam pulses and the pulse shaper to transmit subsequent sets of varying pulse shapes, the results of which are then compared to at least one of the pulse shape results of the prior iterations; and

the control device operably determining if statistical convergence has been obtained from repeated pulse shape set iterations.

30. The system of Claim 29 wherein the laser operably transmits a laser beam of less than about 20 femtosecond duration.

31. The system of Claim 29 wherein the detection device is part of a matrix-assisted laser desorption ionization, post-source decay system and the detection device is a mass spectrometer, and the control device includes a microprocessor.

32. The system of Claim 29 wherein the specimen is a protein and the control device assists in determining a sequence of the protein.

33. The system of Claim 29 wherein the control device varies the laser beam emission in an adaptive manner.

34. A system for use with living tissue, the system comprising:

a high peak intensity laser beam pulse; and

a device operable to change a characteristic of the pulse prior to emission of the pulse upon the living tissue;

wherein nonlinear transitions induced by each pulse are controlled.

35. The system of Claim 34 wherein the device uses a pulse shaper and the desired eradicated substances in the tissue undergo two photon absorbtion.

36. The system of Claim 34 wherein the pulse has a duration of less than fifty one femtoseconds.

37. The system of Claim 34 further comprising generating an optical tomography image produced by the shaped pulse passing through the tissue.

38. The system of Claim 34 wherein the pulse shaper enhances two photon absorbtion by a therapeutic substance and substantially prevents three photon induced damage of adjacent healthy tissue.

39. The system of Claim 34 wherein the device includes a chirped phase mask modifying the beam.

40. The system of Claim 34 wherein the pulse is shaped to enhance targeted mutliphoton damage to modify or destroy certain molecules in the living tissue.

41. A method of controlling a laser beam, the method comprising:

(a) emitting a laser beam pulse of less than about 1 picosecond duration;

(b) shaping the laser beam pulse with a smooth phase function; and

(c) controlling the nonlinear optical processes induced by the laser beam pulse.

42. A method of ionizing and determining a characteristic of a specimen, the method comprising:

(a) emitting a laser beam having a pulse duration of less than about 51 femtoseconds;

(b) shaping the laser beam pulse;

(c) sensing a characteristic of the specimen after the laser beam pulse has ionized at least a portion of the specimen;

(d) varying laser beam pulse shapes emitted upon the specimen for subsequent iterations;

(e) sensing characteristics of the specimen after the laser beam has ionized at least a portion of the specimen for the subsequent iterations; and

(f) comparing the sensed results.

43. The method of Claim 42 further comprising determining a protein sequence of the specimen based at least in part on the sensed characteristics.